Child Psychiatry Hum Dev (2017) 48:18–31
DOI 10.1007/s10578-016-0649-0

ORIGINAL ARTICLE

Callous-Unemotional Traits Among Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD): Associations with Parenting

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Published online: 10 May 2016

Abstract This study examined the extent to which positive and negative parenting relates to conduct problems (CP) and callous-unemotional (CU) traits among 172 adolescents (72 % males; $M^{age} = 16.91$ years, SD = .67) with attention-deficit/hyperactivity disorder and whether CU traits moderate the link between parenting and CP. Mothers reported on their adolescents' CP, CU traits, and their own parenting practices. Maternal behaviors were observed during a problem-solving communication task. Parents who engaged in more positive parenting (self-reported and observed) reported their adolescents as having lower levels of CU traits. No effect was found for negative parenting. Moderation analyses indicated that lower levels of positive maternal behavior was only associated with higher CP in the presence of higher levels of CU traits. Negative parenting was positively related to CP regardless of CU traits. Positive parenting, irrespective of measurement approach, uniquely relates to adolescents' CU traits while both positive and negative parenting relate to CP.

Keywords Callous-unemotional traits · ADHD · Adolescence · Parenting · Conduct problems

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Introduction

Disruptive behavior disorders such as attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) affect 5–10 % of children and adolescents and represent the most common referrals to mental health clinics [1, 2]. Disruptive behavior disorders, when left untreated, tend to have a highly stable and persistent course [3, 4]. For example, children exhibiting early signs of conduct problems (CP) and delinquency (i.e., ODD/CD) continue to have difficulty in adolescence and adulthood experiencing a host of negative functional outcomes including increased risk for substance use and school drop-out as well as greater involvement in the criminal justice system [5–7]. While numerous risk factors have been recognized as important for understanding the development of CP, more recent research has highlighted the importance of callous-unemotional traits (CU), which refer to low levels of guilt, empathy, and caring for others [8], for identifying a particular at-risk subgroup of children.

As reviewed by Frick and colleagues [8] CU traits are important characteristics for identifying a subgroup of children who display a more pervasive, severe, and aggressive pattern of antisocial behavior. It is important to note that CU traits represent only one dimension of the broader construct of psychopathy which also includes narcissism, fearless dominance, and behavioral disinhibition marked by impulsive-antisocial behavior [8, 9]. Of interest to the current study is the role of parenting in the development of both CP and CU traits. The importance of both positive and negative parenting dimensions in the development of children's CP is well established. For example, within the negative parenting domain, coercive parent–child interactions, poor parental monitoring/supervision, higher

levels of parent–child conflict, and harsh punishment have all been associated with higher levels of aggression/CP and lower levels of prosocial behaviors [10–13]. Within the positive parenting domain, higher levels of parental warmth and responsiveness, a positive parent–child relationship, and consistent discipline practices predict lower levels of aggression/CP and promote prosocial behaviors [14–16]. Hence, while both positive and negative parenting dimensions are important for the development of aggression/CP, it is less clear whether both parenting dimensions impact the development of children's CU traits.

In terms of how parenting may impact the development of children's CU traits, significant work has highlighted the role of parenting in promoting the development of children's conscience and empathy [17]. Specifically, parents who show greater sensitivity and warmth arguably provide a powerful model for stimulating empathetic concerns as early as infancy/toddlerhood [18, 19]. A warm and trusting attachment relationship can further enhance children's ability to engage in empathetic behaviors towards others [20–22]. Empirical data supports these notions as infants who experience higher levels of parental warmth/responsiveness increase their empathetic responding overtime [23] and are more likely to express guilt following transgressions [24]. Within an older sample of fifth graders, Pardini et al. [25] found that child-reported parental warmth/involvement predicted decreases in CU traits over a 1-year period.

In addition to promoting empathy, other aspects of parenting, in particular parenting practices/discipline strategies, may also inhibit the development of psychopathic features such as CU traits. For example, authoritative parenting practices consisting of firm and consistent discipline, without harshness and more warm/positive in nature, is associated with the development of empathy [26]. Further evidence for the role of parenting in the development of CU traits comes from intervention studies showing that changes in parenting skills can improve children's expression of CU traits [27].

Waller et al. [28] provide an excellent recent review of the associations between parenting, CU traits, and youth CP/antisocial behaviors as reported in 30 studies with samples that spanned from early childhood through adolescence. Overall, when considering the 10 studies that have examined direct associations between parenting and CU traits, it appears that both positive and negative dimensions of parenting are associated with CU traits. Specifically, whereas the negative dimension of parenting (e.g., negative discipline, harsh parenting, corporal punishment, inconsistent discipline) was found to predict higher levels of CU traits across five longitudinal studies [25, 29–32], the positive dimension of parenting was associated with lower levels or decreases in CU traits over time [25, 33, 34].

Alternatively it may also be the case that CU traits can moderate the link between parenting and youths' conduct problems. For example, prior theoretical work has suggested that youth with high levels of CU traits may be less influenced by negative parenting dimensions due to reduced sensitivity to punishment [35] and/or physiological hypoarousal [36]. However, Waller et al. [28] found mixed evidence across 10 studies in terms of CU traits moderating the link between parenting dimensions and CP with one study indicating that the link between parenting and CP was moderated by high or low levels of CU traits depending on the dimension of parenting (positive or negative) that was examined [37].

Waller et al. [28] suggested important avenues for future research. First, of the 30 studies that were reviewed, only five employed observational techniques to assess parenting. The vast majority of studies utilized parent report to measure both children's CU traits and parenting. As such, common method variance (i.e., systematic error variance shared among variables measured by the same reporter) may have contributed to the reported associations between parenting and CU, as well as to the appearance that CU traits moderated the effects of parenting and children's CP. Second, in terms of developmental periods, only two studies (neither of which utilized observational measurement) examined direct associations between parenting and CU traits in adolescence. Pardini and Loeber [32] found among 13–14 year olds that after accounting for ADHD and CP, only poor parent–child communication (as reported by parent and youth) predicted higher initial levels of CU traits. Barker et al., [20] reported that maternal reports of harsh parenting at age 4 predicted higher levels of CU traits at age 13. Given the unique developmental shift in parenting demands (e.g., need for more effective communication; social contracting; monitoring) that occurs as adolescents increase their autonomy [38–40] along with higher rates and more severe CP in adolescence [41, 42], it is important to determine which dimensions of parenting may be associated with adolescents' CU traits as well as whether CU traits moderate the link between certain dimensions of parenting and adolescents' CP.

Goals of the Current Study

The goal of this study was to examine within a large sample of adolescents diagnosed with a disruptive behavior disorder: (1) the extent to which positive and negative parenting dimensions relate to adolescents' CP and CU traits and (2) whether CU traits moderate the link between parenting dimensions and adolescents' CP. To overcome some of the limitations noted by the Waller et al. [28] review, the current study examined parenting in a multimethod fashion comparing the unique contribution of an

observation based measure versus a traditional self-report parenting questionnaire. Inclusion of observational methods is critical as it eliminates not only the common method variance problem but also potential response-bias from self-report parenting questionnaires. Additionally, we measured various parenting constructs (e.g., discipline strategies, parenting practices) that have been conceptualized as being part of an authoritative parenting style in terms of balancing the warmth and control dimensions [43] as well as implicated in the coercive cycle that promotes further conduct problems [11]. The unique use of an observation based measure during a child-parent problem solving situation also allowed us to examine more specific positive (e.g., praising, stating the other's opinion) and negative maternal behaviors (e.g., yelling, ridiculing, interrupting with criticism). These parenting behaviors, practices and discipline strategies (being more consistent with discipline, less harshness, better supervision/monitoring, more positive attention) are also the target of most behavioral parent training programs for youth with CP [44].

In line with previous research on adolescent samples [20, 25], we expected that positive parenting would be associated with lower levels of CP and CU traits while higher levels of negative parenting would be associated with higher levels of CP and CU traits. We expected that observed parenting would also provide unique variance towards the association with CP and CU traits, above and beyond questionnaires. Additionally, based on previous theoretical and empirical work with younger samples [28–30] we expected that the link between negative aspects of parenting and adolescents' CP would be moderated by CU traits. Specifically, we expected that the link between negative parenting and CP would be stronger among adolescents with lower levels of CU traits whereas the association between positive aspects of parenting and adolescents' CP would be stronger among adolescents with higher levels of CU traits.

Method

Participants and Recruitment

Participants in this study were adolescents with ADHD and their parent(s) who enrolled in an intervention study that used family therapy to promote a successful transition to licensed driving [45]. Families with a 16- to 18-year old adolescent within a 30 mile radius of a western New York University were sent a direct mail recruitment flyer from a marketing company that described the study, eligibility criteria, and asked interested families to contact the investigators for more information. Over 743 families completed a phone screening to determine eligibility, which included: (1) the teen being in possession of a permit to drive, (2) having both a parent and the teen be willing to participate in the study, and (3) a history of behaviors and impairment consistent with a diagnosis of ADHD-Combined Type (DSM-IV-TR). Exclusion criteria included the teen having already obtained a driver's license or completed a driver's education course, having conditions that would prohibit driving (e.g., seizures), as well as any significant developmental delay (e.g., full scale IQ below 70) or another subtype of ADHD. Five hundred seventy-one families were screened out due to not meeting the inclusion criteria.

The final participating sample consisted of 172 adolescents (72 % males) with ADHD-Combined Type along with their parent(s). The primary, female caregivers enrolled into the study were 99 % mothers. The mean age of the participating adolescents was 16.91 years (SD = .67; range 15.97–19.04) with 86 % being Caucasian; 11 % African American, and 3 % American Indian/Alaska Native/Multiracial. In terms of educational background, 52 % of the mothers had at least a college degree; 20 % had some college, and 28 % had a high school diploma or high school equivalency. To confirm adolescents' ADHD-Combined Type diagnosis, parents completed the Disruptive Behavior Disorders interview (DBD; [46], a semi-structured interview on Diagnostic and Statistical Manual (DSM-IV-TR) symptoms of ADHD administered by advanced graduate students supervised by a Ph.D. level psychologist. Parents and teachers also completed the Disruptive Behavior Disorders rating scale of ADHD symptoms [47] and the Impairment Rating Scale [48], and clinicians conducted a review of school records. Ph.D. level psychologists made the diagnosis using information collected from the DBD interview, rating scales, as well as school records. All adolescents met DSM-IV criteria for ADHD-Combined Type with 44.2 % also meeting criteria for either Oppositional Defiant Disorder or Conduct Disorder. Seventy percent of adolescents were taking a psychotropic medication.

Study Design and Procedure

This study was approved by the university's Institutional Review Board. All families participated in a baseline assessment scheduled prior to the start of the intervention study. During this assessment, parents and teens filled out various questionnaires as well as participated in two 10-min parent-adolescent videotaped observations. For this study, the extent to which positive and negative dimensions of parenting relate to adolescents' CU traits is examined. Parents were asked to work with the child's prescribing physician to withhold stimulant medication on the day of

the parent-teen interaction and to complete ratings for unmedicated teen behavior.

Parents and teens were asked to complete the Issues Checklist (IC; [49], a measure of parent and teen conflict, in which they indicated frequency and intensity of conflict for several topics over the last 2 weeks. The most intense, frequent topics endorsed by each were chosen as the topics for discussion in the observations. The topic started with first (i.e., parent or teen) was counter-balanced across participants. Parents and teens were asked to discuss possible solutions to each issue and the observation was videotaped. Observations were coded using the Interaction Behavior Code described further below.

Measures of Conduct Problems and CU Traits

Disruptive Behavior

ADHD, ODD, and CD symptoms were measured using the Disruptive Behavior Disorders (DBD) rating scale [38], which was administered to the adolescent's parent during the baseline assessment. The DBD is a 45-item measure that asks parents/teachers to rate, on a 0–3 point Likert scale, the DSM-IV symptoms of ADHD, ODD, and CD. Average raw scores across each domain (ADHD, ODD, and CD) were computed. Given the high correlation between ODD and CD scores ($r = .74$, $p < .001$), an overall ODD/CD score was computed by taking the mean of all symptoms. The total raw score of the conduct problems DSM-oriented subscale of the *Child Behavior Checklist Form* 4–18 [50] was also examined. To reduce the number of analyses and given the high correlation between parent reports on the DBD (ODD/CD) and the CBCL conduct problems subscale ($r = .82$, $p < .001$), an overall CP score was computed by standardizing both scales and taking their average.

Callous-Unemotional Traits

Parents completed the *Inventory of Callous-Unemotional Traits* (ICU; [51]. The ICU is a 24 item questionnaire which measures, on a four-point Likert scale ranging from 0 ("not at all true") to 3 ("definitely true"), children's callous and unemotional traits. The current study examined the overall ICU score, which was computed by summing all the items ($\alpha = .80$). While there are no established cut-off scores on the ICU for adolescents, a recent paper by Kimonis et al. [52] with a younger sample (mean age of 9) found that a cut-off score of 24 or higher on the ICU best captured a trajectory of highly stable conduct problems and CU traits. Within adolescent samples [53–57], the cut-off score on the ICU has ranged from 27 to 38 ($M = 32.72$; SD = 9.83). Consistent with these previous adolescent studies, our current sample's average total ICU score was 32.28 with 44 % of the sample scoring above the cut-off score of 32.72.

Measures of Parenting

Parenting Practices

To assess parenting practices parents were asked to complete the *Alabama Parenting Questionnaire* (APQ; [58], which consists of 42-items measuring: positive parenting, parental involvement, inconsistent discipline, poor monitoring/supervision, and corporal punishment. Responses for items are based on a 5 point scale: "never," "almost," "never," "sometimes," "often," and "always." The criterion validity and utility of the APQ have been supported [58, 59]. Consistent with prior work using the APQ with adolescents [60], the current study examined all subscales (α's = .72–.79; positive parenting, parental involvement, poor monitoring/supervision, and inconsistent discipline) except corporal punishment (due to the lack of variability given the age of the sample).

Discipline Strategies

Mothers completed the *Parenting Scale* (PS; [61], a 30-item self-report measure that assesses parental discipline practices. The effectiveness of discipline techniques, as perceived by parents, is measured based on three factor scores (Laxness, Over-Reactivity, Verbosity) and a total score. The current study examined the three scales of the PS ($\alpha = .86$ for laxness; $\alpha = .60$ for over-reactivity; $\alpha = .51$ for verbosity).

Observed Parenting

The *Interaction Behavior Code* (*IBC*) is a behavioral coding system with documented reliability and validity [62–64], designed to assess global impressions of parent-adolescent problem-solving communication behavior. Coders are instructed to rate 32 behavioral items in terms of their presence or absence of the behaviors (items 1–22) or the frequency for items 23–32 (no = 0 points, a little = .5 point, and a lot = 1 point). These scores were aggregated into a composite of *positive maternal behaviors* (e.g., praising, making suggestions, stating the other's opinion, asking what the other would like) and *negative maternal behaviors* (e.g., yelling, ridicule, negative exaggeration, name-calling, interrupting with criticism, making demands). Undergraduate student coders were trained to 80 % agreement with a criterion tape and all observations were coded three times to assess reliability. Reliability for the *positive* and *negative* maternal behavior composites were good (ICCs = .68, and .83, respectively across 3 raters of 171 dyad observations).

Data Analysis Plan

All analyses were conducted using the Statistical Package for the Social Sciences, version 22.0 (SPSS 22.0). Given that the current study focused on the baseline assessment, there were minimal missing data (only one parent; <1 %). Given the number of parenting questionnaires, factor analyses were first conducted to determine the feasibility of creating positive and negative parenting composites. Next, associations between the derived factor(s) and demographic variables were examined. Regression analyses were then conducted to determine the extent to which the parenting factor(s) uniquely related to adolescents' CP and CU traits. These simultaneous regressions were first done separately for parent ratings and observation measures with the final model examining both simultaneously. Lastly, using hierarchical regressions, we examined the extent to which adolescents' CU traits moderated the association between parenting factor(s) and conduct problems. All predictors were grand mean centered and significant interactions were probed following procedures outlined by Aiken and West [65] and the use of Hayes and Matthes' [66] macro. Specifically, selected interactions were plotted by regressing CP (y) on parenting (x) as a function of two values of the significant moderator (CU traits), Z_L and Z_H (i.e., one standard deviation below the mean, one standard deviation above the mean). Unstandardized B was used to calculate the regression lines. Finally, post hoc t-tests were used to determine whether the slopes of the lines plotted were significantly different from zero.

Results

Preliminary Analyses: Factor Analyses

A principal component factor analysis with a promax rotation was first conducted to determine the extent to which the parenting measures (PS and APQ), loaded into separate positive and negative dimensions. The seven indicator variables, which were standardized, included: (a) laxness subscale-PS, (b) over reactivity subscale-PS, (c) verbosity subscale-PS, (d) inconsistent discipline subscale-APQ, (e) monitoring and supervision (reverse score of poor monitoring subscale APQ), (f) involvement total score-APQ, and (g) positive parenting total score-APQ.

From this analysis, two factors emerged with an eigenvalue above one. The first factor ($\lambda = 2.83$) explained 40.49 % of the total variance across items for this sample while the second factor ($\lambda = 1.38$) explained 19.72 % of the total variance across the items for this sample. Consistent with the original intent of the items, the first factor was referred to as the *Negative Parenting factor* as items a–d positively loaded on this factor. The second factor was referred to as the *Positive Parenting factor* as items e–g positively loaded on this factor. Guided by the results of the factor analysis (see Table 1 for factor loadings), subsequent analyses used an overall Negative Parenting score (average of items a–d) and an overall Positive Parenting score (average of items e–g). Descriptive statistics for these factors and bivariate correlations among all study variables are presented in Table 2.

Preliminary Analyses: Demographic Variables

An analysis of the demographic variables revealed a significant association between adolescent age and the observed negative maternal behavior composite ($r = .20$, $p < .01$) such that older adolescents experienced more negative maternal behaviors during the problem-solving observation. Family income was also associated with the observed negative maternal behavior composite ($r = -.18$, $p < .05$) and marginally with observed positive maternal behavior ($r = .15$, $p < .06$) such that adolescents from higher income households experienced less negative maternal behaviors and more positive maternal behaviors during the problem-solving observation. No other significant associations between demographic variables and any of the study's variables emerged. Additionally, medication status was not associated with any of the study's variables. Of note, while some studies have documented sex differences in terms of adolescents' CU traits [67–69], the current study failed to find any significant differences in CU traits among adolescent boys ($M = 32.94$, SD = 9.63) versus girls ($M = 30.58$, SD = 10.24, $t(170) = 1.42$, $p = .16$). Hence, only adolescent age and family income were controlled in subsequent analyses.

Regression Analyses: Parenting and CP

Model 1: Only Parenting Questionnaires

As seen in Table 3, regression analyses for model 1 [$F(4, 154) = 7.93$, $p < .001$] indicated that both the positive and negative parenting composites were uniquely associated with CP ($\beta = -.32, p < .001$ and $\beta = .16, p < .05$, respectively). The parenting composites and demographic factors explained 17 % of the observed variation in CP ($R^2 = .17$).

Model 2: Only Parenting Observation

While the overall model using observation measures was only marginally significant, [$F(4, 153) = 2.06$, $p < .10$], there was some indication that whereas higher levels of positive maternal behaviors during the problem-solving interaction were significantly associated with lower levels of CP ($\beta = -.20$, $p < .05$), observed negative maternal behaviors were not.

Table 1 Factor loadings from principal components factor analysis of parenting questionnaires

Subscales	Negative parenting	Positive parenting
Laxness subscale-PS	**.83**	−.29
Over reactivity subscale-PS	**.66**	−.45
Verbosity subscale-PS	**.75**	−.08
Inconsistent discipline subscale-APQ	**.81**	−.28
Monitoring and supervision-APQ	−.30	**.47**
Involvement total score-APQ	−.27	**.89**
Positive parenting total score-APQ	−.18	**.86**

Bolded subscales were used to create composites of negative and positive parenting, respectively

PS Parenting Scale, *APQ* Alabama Parenting Questionnaire

Table 2 Correlations among variables and descriptives

Variable	Mean (SD)	Range (min–max)	1	2	3	4	5	6	7	8
1. Age	16.91 (.67)	15.97–19.04	–							
2. Family income	$83,268 ($43,823)	0–$239,000	−.16*	–						
3. CU traits (P)	32.28 (9.83)	8–64	.03	−.03	–					
4. Conduct problems z-score (P)	0 (.80)	–.99 to 2.85	.00	−.11	.62***	–				
5. Negative parenting factor z-score (P)	0 (.77)	−1.71 to 1.96	.03	−.01	.13^{+}	.21**	–			
6. Positive parenting factor z-score (P)	0 (.76)	−2.61 to 2.06	−.11	.12	−.30***	−.32***	−.35***	–		
7. Negative maternal behaviors z-score (O)	0 (1.00)	−2.04 to 2.60	.20**	−.18*	.09	.12	.26***	−.03	–	
8. Positive maternal behaviors z-score (O)	0 (1.00)	−2.66 to 2.37	−.09	.15^{+}	−.20**	−.19*	−.15^{+}	.15^{+}	−.46***	–

CU callous-unemotional traits, *O* observational measure/assessment, *P* parent report measure

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Model 3: Combined

The final regression model included observed and rated parenting behaviors jointly was statistically significant, $F(4, 153) = 7.12$, $p < .001$. Building on the previous models, both positive observed ($\beta = -.14$, $p < .10$) and positive rated parenting ($\beta = -.30$, $p < .001$) as well as the negative parenting factor ($\beta = .15$, $p < .10$) were uniquely related to adolescents' CP. The set of predictors explained 19 % of the variation in CU traits ($R^2 = .19$).

Regression Analyses: Parenting and CU Traits

Model 1: Only Parenting Questionnaires

As seen in Table 4, regression analyses for model 1 [$F(4, 154) = 5.32$, $p < .001$] indicated that whereas the positive parenting composite was uniquely associated with lower levels of callous unemotional traits ($\beta = -.33$, $p < .001$), the negative parenting composite was not. The parenting composites and demographic factors explained 12 % of the observed variation in callous unemotional traits ($R^2 = .12$).

Model 2: Only Parenting Observation

While the overall model using observation measures was not significant, [$F(4, 153) = 1.91$, $p = .11$], there was some indication that whereas higher levels of positive maternal behaviors during the problem-solving interaction were significantly associated with lower levels of callous unemotional traits ($\beta = -.24$, $p = .009$), observed negative maternal behaviors were not.

Model 3: Combined

The final regression model included observed and rated parenting behaviors jointly was statistically significant, $F(4, 153) = 6.54$, $p < .001$. Building on the previous models, both positive observed and positive rated parenting measures were uniquely related to adolescents' CU traits ($\beta = -.32$, $p < .001$ for questionnaire and $\beta = -.17$, $p = .027$ for observation). In contrast, neither observed or rated negative parenting behaviors made unique contributions to CU traits. The set of predictors explained 15 % of the variation in CU traits ($R^2 = .15$).

Table 3 Model for predicting CP

	β	*B* (SE *b*)	95 % CI	Model R^2	F test statistic
Model 1: Only Parenting Questionnaires					
Adolescent age	−.04	−.05 (.10)	−.26, .15	.17	7.93***
Family income	−.07	.00 (.00)	.00, .00	–	–
Negative parenting factor (P)	.16*	.20 (.10)	.01, .39	–	–
Positive parenting factor (P)	−.32***	−.39 (.10)	−.57, −.20	–	–
Model 2: only parenting observation					
Adolescent age	−.02	−.02 (.11)	−.25, .20	.05	2.06^{+}
Family income	−.08	.00 (.00)	.00, .00	–	–
Negative maternal behavior (O)	.00	.00 (.09)	−.17, .17	–	–
Positive maternal behavior (O)	−.20*	−.19 (.08)	−.35, −.02	–	–
Model 3: combined					
Adolescent age	−.05	−.07 (.11)	−.27, .14	.19	7.12***
Family income	−.05	.00 (.00)	.00, .00	–	–
Negative parenting factor (P)	.15^{+}	.19 (.10)	.00, .37	–	–
Positive parenting factor (P)	−.30***	−.37 (.10)	−.55, −.18	–	–
Positive maternal behavior (O)	−.14^{+}	−.13 (.07)	−.27, .00		

P parenting measure, *O* observation, *CP* conduct problems

$^{+}$ $p < .10$; *** $p < .001$; ** $p < .01$; * $p < .05$

Table 4 Model for predicting CU traits

	β	*B* (SE *b*)	95 % CI	Model R^2	F test statistic
Model 1: Only Parenting Questionnaires					
Adolescent age	−.03	−.41 (1.09)	−2.57, 1.75	.12	5.32***
Family income	.01	.00 (.00)	.00, .00	–	–
Negative parenting factor (P)	.06	.69 (1.02)	−1.32, 2.70	–	–
Positive parenting factor (P)	−.33***	−4.13 (1.02)	−6.13, −2.12	–	–
Model 2: only parenting observation					
Adolescent age	.00	−.01 (1.18)	−2.34, 2.33	.05	1.91
Family income	.00	.00 (.00)	.00, .00	–	–
Negative maternal behavior (O)	−.06	−.56 (.89)	−2.31, 1.19	–	–
Positive maternal behavior (O)	−.24**	−2.28 (.86)	−3.97, −.59	–	–
Model 3: combined					
Adolescent age	−.04	−.58 (1.11)	−2.77, 1.61	.15	6.54***
Family income	.03	.00 (.00)	.00, .00	–	–
Positive parenting factor (P)	−.32***	−4.06 (.96)	−5.95, −2.18	–	–
Positive maternal behavior (O)	−.17*	−1.63 (.73)	−3.06, −.19	–	–

P parenting measure, *O* observation, *CU* Callous-unemotional traits

*** $p < .001$; ** $p < .01$; * $p < .05$

Regression Analyses: CU Traits Moderating the Link Between Parenting and CP

Model 1: Only Parenting Questionnaires

As seen in Table 5, regression analyses in step 1 of Model 1, $F(5, 153) = 25.29$, $p < .001$, total $R^2 = .45$, indicated that even after accounting for demographic variables, significant associations emerged between the negative parenting composite as well as adolescents' CU traits and conduct problems ($\beta = .13$, $p = .039$ and $\beta = .57$, $p < .001$, respectively). A marginal association also emerged between the positive parenting composite and adolescents' conduct problems ($\beta = -.13$, $p = .054$). However, as seen in step 2, this observed main effect was qualified by a marginal interaction between the positive parenting composite and CU traits in predicting conduct problems ($\beta = -.13$, $p = .062$).

Model 2: Only Parenting Observation

Step 1 of model 2, $F(5, 152) = 21.63$, $p < .001$, total $R^2 = .41$, failed to find any significant associations between observed levels of positive or negative maternal behaviors during the problem-solving interaction and adolescents' overall conduct problems and only duplicated the main effect of adolescents' CU traits being associated with conduct problems ($\beta = .62$, $p < .001$). However, step 2 shows a significant interaction between observed levels of positive maternal behaviors during the problem-solving interaction and CU traits in predicting conduct problems ($\beta = -.17$, $p = .031$).

Model 3: Combined

Finally, Model 3 combined all significant main effects as well as interaction terms. As seen in step 1 of Table 5, the significant main effects, $F(6, 151) = 20.92$, $p < .001$, total $R^2 = .45$, between the negative parenting composite and adolescents' CU traits on conduct problems remained ($\beta = .13$, $p = .047$ and $\beta = .56$, $p < .001$, respectively). Additionally, step 2 indicates that the interaction between positive maternal behaviors during the problem-solving interaction and CU traits in predicting conduct problems remained ($\beta = -.13, p = .032$). As seen in Fig. 1, CU traits moderated the association between observed positive maternal behaviors and conduct problems, such that lower levels of positive maternal behaviors were only predictive of conduct problems for adolescents with high levels of CU traits ($t = -2.16, b = -.19, p = .032$), whereas positive maternal behaviors were unrelated to conduct problems for adolescents with low levels of CU traits ($t = .80, b = .06, p = .426$).

Discussion

The purpose of this study was to examine within a large sample of adolescents diagnosed with a disruptive behavior disorder: (1) the extent to which positive and negative

Table 5 Model for predicting CP moderated by CU traits

	β	*B* (SE *b*)	95 % CI	Model R^2	F test statistic
Model 1: Only Parenting Questionnaires					
Step 1. Adolescent age	−.02	−.03 (.08)	−.20, .13	.45	25.29***
Family income	−.08	.00 (.00)	.00, .00	–	
CU traits (P)	.57***	.06 (.01)	.04, .07	–	–
Negative parenting factor (P)	.13*	.16 (.08)	.01, .32	–	–
Positive parenting factor (P)	−.13$^+$	−.16 (.08)	−.32, .01	–	–
Step 2. negative parenting factor (P) * CU traits (P)	−.09	−.01 (.01)	−.03, .01	.47	1.94
Positive parenting factor (P) * CU traits (P)	−.13$^+$	−.02 (.01)	−.03, .00	–	–
Model 2: only parenting observation					
Step 1. Adolescent age	−.02	−.02 (.09)	−.20, .15	.41	21.63***
Family income	−.08	.00 (.00)	.00, .00	–	–
CU traits (P)	.62***	.06 (.01)	.05, .07	–	–
Negative maternal behavior (O)	.04	.03 (.07)	−.10, .17	–	–
Positive maternal behavior (O)	−.05	−.05 (.07)	−.18, .08	–	–
Step 2. Negative maternal behavior (O) * CU traits (P)	−.06	−.01 (.01)	−.02, .01	.43	2.49$^+$
Positive maternal behavior (O) * CU traits (P)	−.17*	−.02 (.01)	−.03,−.01	–	–
Model 3: combined					
Step 1. Adolescent age	−.03	−.04 (.09)	−.21, .14	.45	20.92***
Family income	−.07	.00 (.00)	.00, .00	–	
CU traits (P)	.56***	.05 (.01)	.04, .07	–	–
Negative parenting factor (P)	.13*	.16 (.08)	.01, .31	–	–
Positive parenting factor (P)	−.13$^+$	−.16 (.08)	−.32, .01	–	–
Positive maternal behavior (O)	−.05	−.05 (.06)	−.16, .07	–	–
Step 2. positive parenting factor (P) * CU traits (P)	−.09	−.01 (.01)	−.03, .00	.48	–
Positive maternal behavior (O) * CU traits (P)	−.13*	−.01 (.01)	−.03, −.01	–	3.42*

CP conduct problems, *P* parenting measure, *T* teacher measure, *O* observation, *CU* Callous-unemotional traits

*** $p < .001$; ** $p < .01$; * $p < .05$; $^+$ $p < .07$

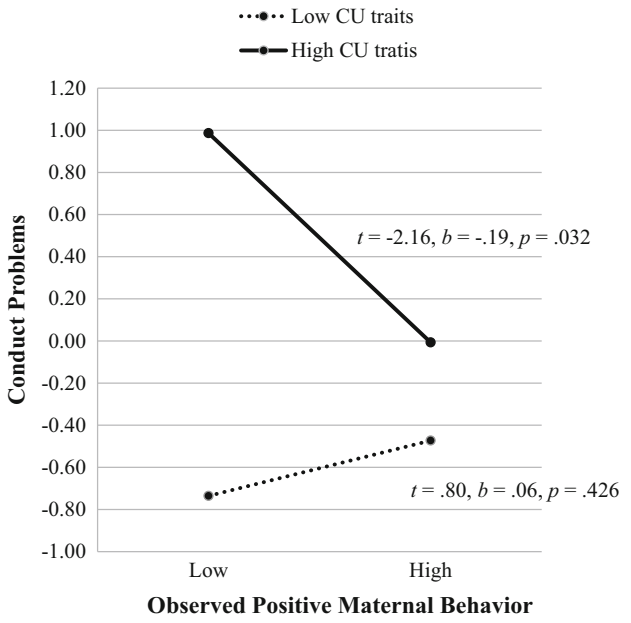

Fig. 1 Adolescents' CU traits moderating the association between observed positive maternal behaviors and conduct problems

parenting dimensions (measured both via observation and traditional questionnaires) relate to adolescents' CP and CU traits and (2) whether CU traits moderate the link between parenting dimensions and adolescents' CP. Results indicated that positive aspects of parenting, irrespective of measurement approach, were associated with lower levels of CU traits. No significant associations were found between negative parenting (either observed or via questionnaires) and adolescent's CU traits. Additionally, both positive and negative dimensions of parenting were related to CP, although the effect of positive parenting on CP was moderated by CU traits such that lower levels of positive maternal behavior was only associated with higher conduct problems in the presence of higher levels of CU traits. The implications of these findings are discussed in detail below.

The current study's findings replicate the notion that both positive and negative dimensions of parenting are implicated in the development of CP [10, 11, 15, 31]. Most importantly and more novel, however, is our findings suggesting that positive aspects of parenting may be more important than negative parenting as it relates to CU traits and its link to CP. In fact, the current findings are consistent with previous work by Pasalich et al. [30] showing that for boys (ages 4–12) with higher levels of CU traits, observed parental warmth was particularly important in predicting conduct problems whereas observed coercive parenting was more strongly related to CP for boys with lower levels of CU traits. Similarly, Kroneman et al. [70] found that lower levels of parental warmth (as self-reported by parents) were associated with more CP only in children (ages 7–8) with high CU traits. When viewed in conjunction with the current study's focus on the late adolescent period (ages 15–18), positive aspects of parenting appear to be important in predicting the development of conduct problems for both children and adolescents with CU traits. However, it is important to note that Falk and Lee [71] found that positive parenting (as self-reported by parents) was negatively related to children's CPs at low to moderate levels of CU traits, but was unrelated to CP at high levels of CU traits. Such inconsistent findings may be due to differences in sample characteristics as well as measurement of CU traits. For example, Falk and Lee [71] examined younger children ($M^{age} = 7$) within a sample that included both children with ADHD as well as typically developing children. Additionally, studies vary in their measurement of CU traits such that Falk and Lee [71] used only six items from the Antisocial Process Screening Device [72]. Hence, it is difficult to determine whether Falk and Lee [71] 's null findings at high levels of CU traits is partially due to a relatively low risk sample such that their "high" CU traits group is not comparable to the current study which used the ICU and had 44 % of adolescents scoring above a score of 32.

The lack of association between negative aspects of parenting and adolescents' CU traits is consistent with work showing that CU traits are associated with punishment insensitivity [35, 73] or lower arousal levels as it relates to fear of negative consequences [36, 74]. On the other hand, children with CU traits have been observed as having high reward sensitivity [75, 76], as well as showing a preference for novel and sensation seeking activities [77]. Perhaps the positive aspects of parenting can be conceptualized as targeting more of the reward dominance style of children with CU traits. To confirm such a hypothesis more research is needed examining how children and adolescents with CU traits physiologically respond to different parenting behaviors in an in vivo setting with a greater physiological reaction (i.e., increases in arousal) occurring during positive reward driven parent–child interactions (e.g., high frequency of labeled praise) versus those that are more negative and perhaps punishment driven (e.g., verbal reprimands, time out). Interestingly, one neuroimaging study found that during punished reversal errors children with CU traits displayed abnormal activity in the ventromedial prefrontal cortex (vmPFC) but not in the ventrolateral or dorsomedial PFC [78]. While more neuroimaging studies are needed, given the critical role of the vmPFC in processing of reinforcement information and expectations, it may be the case that individuals with CU traits have difficulty detecting contingency changes, especially when they are negative in nature.

In terms of limitations, first it is important to once again acknowledge that the cross-sectional nature of this study prevents us from making causal statements regarding the link between positive aspects of parenting and CU traits. While CU traits appear to have a strong heritability link [79, 80], Pardini et al. [25] showed that parental warmth/involvement can predict a reduction in CU traits over a 1 year period among fifth graders. Once again, more longitudinal work is needed examining the reciprocal associations between parenting and children's CU traits across development, especially during the adolescent period when CP becomes more prevalent and severe [41, 42] while parents also adjust their disciplinary practices given adolescents' increase in autonomy [38, 40]. Second, all adolescents in the current study were diagnosed with ADHD, Combined Type Presentation. Hence, while there is a significant comorbidity of CP among ADHD samples [81, 82], there is a significant percentage of adolescents with ADHD with only a Predominantly Inattentive Presentation which tends to be associated with less severe CP [83, 84]. Additionally, there is some evidence to suggest that specific parenting practices may be uniquely related to the inattentive-disorganized symptom among children ages 6–12 [85]. It will be important for future work to investigate the differential impact of parenting on CP among adolescents with different presentations of ADHD as well as those with pure Conduct Disorder (without co-occurring ADHD). In terms of our parenting constructs, it is important to acknowledge that two of the subscales on the parenting scale had relatively poor internal consistency (e.g., $\alpha = .60$ for over-reactivity; $\alpha = .51$ for verbosity) while also noting that our negative parenting factor did not include physical discipline. While we did not examine physical discipline due to the age of our sample ($M^{age} = 16.91$) it is important to recognize that there is a significant literature on the influence of physical discipline/corporal punishment, particularly excessive use of such discipline (i.e., physical abuse), on the development of children's CP [86] and CU traits [34]. Lastly, it is important to point out that the current sample contained relatively high functioning (high SES, low diversity) and treatment seeking parents which may also have affected the link between positive aspects of parenting and CU traits and its link to CP. Given that higher rates of negative parenting is observed among lower SES families [87, 88], it will be important for future work to include more diverse samples.

Despite the limitations, the current study provides some clinical implications regarding the role of positive versus negative parenting as it relates to adolescents' CP and CU traits. Behavioral parent training (PT) programs such as Parent–Child Interaction Therapy (PCIT; [89], Incredible Years [90], Triple P-Positive Parenting Program [91], and Defiant Teen [92] target improvements in parenting and the parent–child relationship via increasing parental praise and supervision/monitoring while decreasing negative parenting practices (e.g., less harshness, intrusiveness) in favor of more consistent discipline practices (e.g., reward programs, time-outs, token economies; privilege removal). While behavioral PT is an evidence-based intervention for children with DBDs [93, 94], prior work has documented that children with higher levels of CU traits tend to be less responsive to behavioral PT [95–98]. For example and as it relates to the current study's differentiation of positive and negative aspects of parenting, Hawes and Dadds [78] reported that parents found children with high CU traits to be less responsive to the disciplinary aspects of PT (i.e., time-outs) whereas the effectiveness of reward strategies (e.g., labeled praise) was not related to CU traits. When viewed in conjunction with the current study findings, it may be the case that not all components of existing behavioral PT interventions may be suitable for youth with CP and CU traits. Instead, it may be the case that the positive phase of these PT interventions need to be extended (e.g., greater number of sessions on improving child-parent relationship, positive parenting skills, greater focus on reward contingency plans) rather than quickly implementing what can be perceived as a more punishment oriented approach (i.e., time-out). Lastly, Pasalich et al. [99], highlighted the importance of improving the parent–child relationship among children with CU traits given the importance of a secure mother–child attachment towards the development of conscience and prosocial behaviors in children temperamentally characterized as fearless [100–102]. While behavioral PT programs such as PCIT do in fact place an important emphasis on improving the parent–child relationship [103], the "master criteria" for families moving past the positive phase of PCIT (child directed interaction) is based on parents acquiring a set number of parenting skills (i.e., labeled praises, reflections, behavioral descriptions). Hence, future work should compare whether changes in the mother–child attachment versus parenting skills better predict treatment response among children with high levels of CU traits.

Summary

The current study suggests, within a sample of adolescents with ADHD, that positive aspects of parenting may be more important than negative parenting as it relates to CU traits and its link to CP. A particular strength of the current study was that the link between positive parenting and adolescents' CU traits was evident irrespective of the method we used to measure parenting. As pointed out by Waller et al. [28], only one study to date had used

observational measures of parenting with adolescents. Hence, the current study highlights the unique information gained by observing parenting behaviors during an adolescent-parent interaction. Of note, a higher association was found among negative parenting measures (observation and questionnaires) versus positive parenting measures. While speculative and in need of further investigation, perhaps parents are better reporters of their negative parenting behaviors which may be more emotionally salient to them when recalling their own experiences with a difficult adolescent. On the other hand, positive parenting behaviors may more easily observed during live interactions. Additionally, the fact that our findings were more consistent within the positive parenting domain may indicate that such positive parenting behaviors are a stronger indication of the parent-teen relationship. Lastly, future work, from both a developmental psychopathology and intervention perspective, that examines or targets the association between parenting behaviors and youth's CU traits need to consider the parent–child relationship (i.e., attachment) given the importance of such a relational variable on the development of children's conscience and prosocial behaviors. Given the dearth of research within the late adolescent period, it would be particularly important to examine whether dynamic changes in the parent-adolescent relationship interact with negative and positive aspects of parenting to predict adolescents' CU traits and subsequent CP either as part of a developmental trajectory or within a treatment study design.

Acknowledgments The research reported here was supported by a research Grant (R01HD058588) from the Eunice Kennedy Shiver National Institute of Child Health and Human Development to the second author. The opinions expressed are those of the authors and do not represent views of NICHD.

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